BAA 07-18 Amendment 2

NOTE: BAA07-18 Amendment 2 will remain open for 60 days after this amendment is published to allow proposers to address the specific Complex System Architectures (CSA) topic area. Proposals responding to the CSA topic received after the 60 days may not be evaluated.

The Complex System Architectures (CSA) effort seeks to exploit how an understanding of the architecture of complex systems can be applied to benefit a broad array of U.S. Department of Defense (DoD) problems and the larger US National interest. A particular area of interest to MTO is identification of the optimal architectures needed to design complex Microsystems. MTO would like to utilize the techniques and strategies employed by various technical disciplines (mathematics, biology, network design, systems engineering, electrical engineering, etc) in developing these architectures to create the most effective future Microsystems technologies. Ideally a measurable system, widely applicable across all domains, would allow for future technological systems to be optimized for factors such as efficiency, power, and robustness.

Engineering complicated technologies requires tradeoffs to be made in order to maximize efficiency for a given application. These compromises often result in a system useful within a small scope and lacking in robustness. Many natural ("non-engineered") complex systems tend to be remarkably efficient and robust, often exploiting adaptive elements to self-correct or re-optimize. These natural systems are often highly interconnected and may be highly dependent on diverse states of the various parts of the system. MTO is interested in identifying fundamental principles found in the architectures of natural systems and applying them to engineered Microsystems technologies.

To this end, the goal of CSA is to formalize design, development, and testing methodologies that can concurrently shorten system development cycles while increasing overall confidence and robustness of system performance. While theoretical investigations are intended as an integral part of the CSA program, it is also expected that studies develop computer simulations and/or hardware test beds to prove out the conclusions developed in such investigations.

This amendment solicits inputs for short-term (3-6 month, 1 to 2 man year) studies to further define the underpinnings of CSA and define opportunities for future MTO program initiatives. Potential areas of interest include:

• Ultra-low power system-on-chip design
• Multi-element non-linear simulation
• Robust, variation tolerant, mixed signal design/architectures

- Effective multi-domain optimization strategies for complex optimized architecture designs
- Reconfigurable and self-reconfiguring microsystems
- Adaptive, highly resource efficient, algorithms for generalized signal analysis, organization of high-dimensional data, and context-aware information exploitation

Specifically excluded are evolutionary approaches based on conventional strategies to optimize Microsystems in these topical areas.

Proposals must highlight the applicability of the proposed work to CSA system challenges. Advances are needed to identify quantifiable metrics for analysis of complex system behavior. Investigations of novel CSA architectures should show the potential effectiveness to a specific problem or problems of interest to MTO. The deliverables should be designed such that relevant study results can be shared with the CSA community to fuel discussion and help generate new ideas. Proposals should include a clear program plan, regular milestones and metrics.

Proposal will be evaluated as they are received with an initial funding selection anticipated 60 days after this amendment is published.

For more information regarding the CSA program and related links, see
http://www.darpa.mil/mto/initiatives/csa/index.html

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